Preface

Thank you for choosing DELTA's high-performance VFD-S Series. The VFD-S Series is manufactured with high-quality components and materials and incorporates the latest microprocessor technology available.

📖 Getting Started

This quick start will be helpful in the installation and parameter setting of the AC motor drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC motor drives. For detail information, refer to the VFD-S User Manual on the CD supplied with the drive.

DANGER!

1. AC input power must be disconnected before any wiring to the AC motor drive is made.
2. A charge may still remain in the DC-link capacitors with hazardous voltages, even if the power has been turned off. To prevent personal injury, please ensure that power has turned off before opening the AC motor drive and wait ten minutes for the capacitors to discharge to safe voltage levels.
3. Never reassemble internal components or wiring.
4. The AC motor drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the AC motor drive output terminals U/T1, V/T2, and W/T3 directly to the AC mains circuit power supply.
5. Ground the VFD-S using the ground terminal. The grounding method must comply with the laws of the country where the AC motor drive is to be installed. Refer to the Basic Wiring Diagram.
6. VFD-S series is used only to control variable speed of 3-phase induction motors, NOT for 1-phase motors or other purpose.
7. VFD-S series shall NOT be used for life support equipment or any life safety situation.

WARNING!

1. DO NOT use Hi-pot test for internal components. The semi-conductor used in AC motor drive easily damage by high-pressure.
2. There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. To prevent damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.
3. Only quality person is allowed to install, wire and maintain AC motor drive.

CAUTION!

1. Some parameters settings can cause the motor to run immediately after applying power.
2. DO NOT install the AC motor drive in a place subjected to high temperature, direct sunlight, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.
3. Only use AC motor drives within specification. Failure to comply may result in fire, explosion or electric shock.
4. To prevent personal injury, please keep children and unqualified people away from the equipment.
5. When the motor cable between AC motor drive and motor is too long, the layer insulation of the motor may be damaged. Please use a frequency inverter duty motor or add an AC output reactor to prevent damage to the motor. Refer to appendix B Reactor for details.
6. The rated voltage for AC motor drive must be ≤240V (≤480V for 460V models) and the mains supply current capacity must be ≤5000A RMS (≤10000A RMS for the ≥40hp (30kW) models).

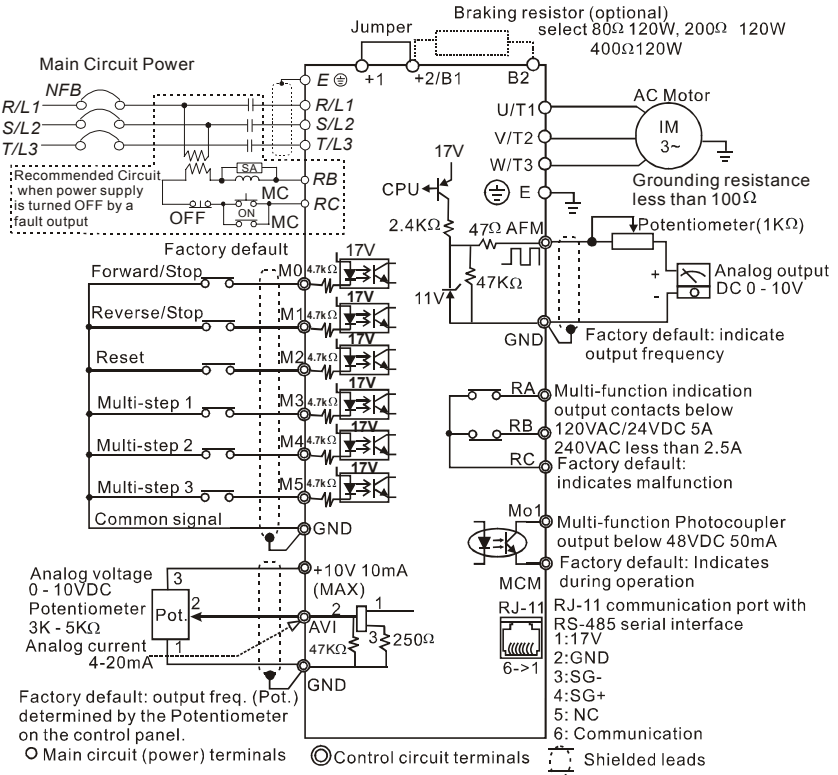
Specifications

Voltage Class			115V Class			230V Class					460V Class			
Model Number VFD-XXXS			002	004	007	002	004	007	015	022	004	007	015	022
Max. Applicable Motor Output (kW)			0.2	0.4	0.75	0.2	0.4	0.75	1.5	2.2	0.4	0.75	1.5	2.2
Max. Applicable Motor Output (HP)			0.25	0.5	1.0	0.25	0.5	1.0	2.0	3.0	0.5	1.0	2.0	3.0
Output Rating	Rated Output Capacity (KVA)		0.6	1.0	1.6	0.6	1.0	1.6	2.9	4.2	1.2	2.0	3.3	4.4
	Rated Output Current (A)		1.6	2.5	4.2	1.6	2.5	4.2	7.5	11.0	1.5	2.5	4.2	5.5
	Maximum Output Voltage (V)		3-phase Proportional to Twice the Input Voltage			3-phase Proportional to Input Voltage								
	Rated Frequency (Hz)		1.0 to 400 Hz											
Input Rating	Rated Input Current (A)		Single phase			Single/3-phase model drive					3-phase			
			6	9	18	4.9/ 1.9	6.5/ 2.7	9.7/ 5.1	15.7/ 9.0	24/ 15	1.7	2.9	5.1	6.9
	Input Current for 1-phase model drive to be used as 3-phase model drive		-- --			1.6	3.0	5.1	8.4	--	-- --			
	Rated Voltage/Frequency		100/110/120 VAC 50/60 Hz			200/208/220/240 VAC 50/60Hz					380/400/415/480 VAC 50/60Hz			
	Voltage/Freq. Tolerance		Voltage: ±10%, Frequency: ±5%											
Control Characteristics	Control System		SPWM (Sinusoidal Pulse Width Modulation, carrier frequency 3k-10kHz)											
	Output Frequency Resolution		0.1Hz											
	Torque Characteristics		Including the auto-torque, auto-slip compensation; starting torque can be 150% at 5Hz											
	Overload Endurance		150% of rated current for 1 minute											
	Accel/Decel Time		0.1to 600 second (2 Independent settings for Accel/Decel Time)											
	V/F Pattern		V/F pattern adjustable											
	Stall Prevention Level		20 to 250%, Setting of Rated Current											
Operating Characteristics	Frequency Setting	Keypad	Setting by ▲ ▼ or Potentiometer											
		External Signal	Potentiometer-5KΩ/0.5W, DC 0 to +10V or 0 to +5V (Input impedance 47KΩ), RS-485 interface, 4 to 20mA (Input impedance 250Ω); Multi-Function Inputs 1 to 5 (7 steps, Jog, up/down)											
	Operation Setting Signal	Keypad	Setting by RUN, STOP											
		External Signal	M0 to M5 can be combined to offer various modes of operation, RS-485 serial interface (MODBUS).											
	Multi-Function Input Signal		Multi-step selection 0 to7, Jog, accel/decel inhibit, first/second accel/decel switch, counter, 8-step PLC operation, external Base Block (NC, NO), increase/decrease Master Frequency											
	Multi-Function Output Indication		AC Drive Operating, Frequency Attained, Non-zero, Base Block, Fault Indication, Local/Remote indication, PLC Operation indication.											
	Analog Output Signal		Analog frequency/current signal output.											
Other Function			AVR, S-Curve, Over-Voltage/Over-Current Stall Prevention, Fault Records, Adjustable Carrier Frequency, DC Braking, Start Frequency for DC Braking, Momentary Power Loss restart, Frequency Limits, Parameter Lock/Reset, PID Feedback Control, Reverse Inhibition, etc.											
Built-in EMI Filter			VFD002S21E, VFD004S21E, VFD004S43E, VFD007S21E, VFD007S43E, VFD015S21E, VFD015S43E, VFD022S21E, VFD022S43E											
Protection			Self-testing, Over Voltage, Over Current, Under Voltage, Overload, Overheating, External Fault, Electronic thermal, Ground Fault.											
Cooling			Forced air-cooling (**ONLY FOR** 022S2XA/B; XXXS43A/B/E 1HP~3HP; XXXSXXD; XXXS21E 400W~3HP). Others are Natural air-cooling.											
Enviroment	Installation Location		Altitude 1,000 m or below, keep from corrosive gasses, liquid and dust											
	Pollution Degree		2											
	Ambient Temperature		-10°C to 40°C (Non-Condensing and not frozen)											
	Storage Temperature		-20°C to 60°C											
	Ambient Humidity		Below 90% RH (non-condensing)											
	Vibration		9.80665m/s^2 (1G) less than 20Hz, 5.88m/s^2 (0.6G) at 20 to 50Hz											

Basic Wiring Diagram

Users must connect wiring according to the following circuit diagram shown below.

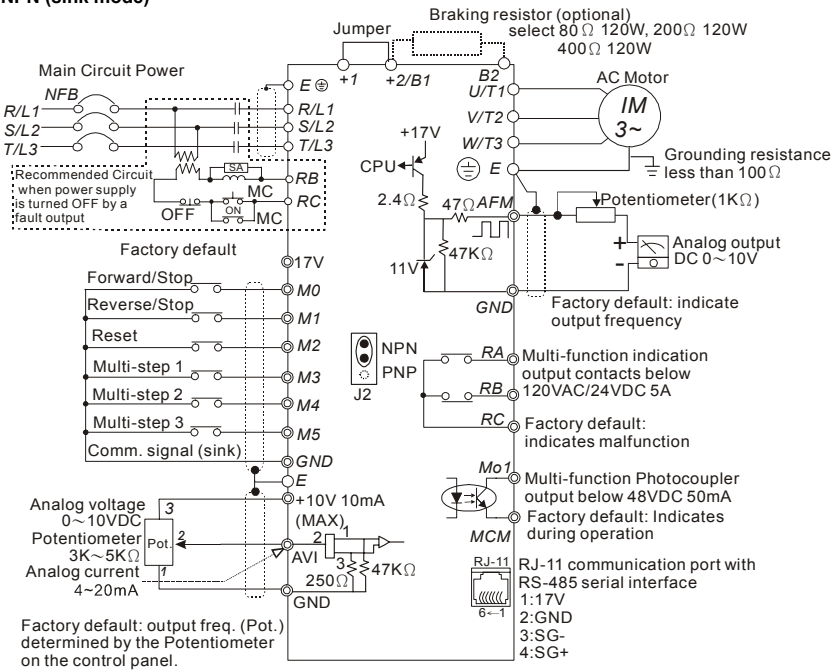
For VFDXXXSXXA/B/D/U



NOTE: Do not plug in a Modem or telephone line to the RS-485 communication port, permanent damage may result. Terminal 1 & 2 are the power sources for the optional copy keypad and should not be used while using RS-485 communication.

* If it is single phase model, please select any of the two input power terminals in main circuit power.

For VFDXXXSXXE
NPN (sink mode)

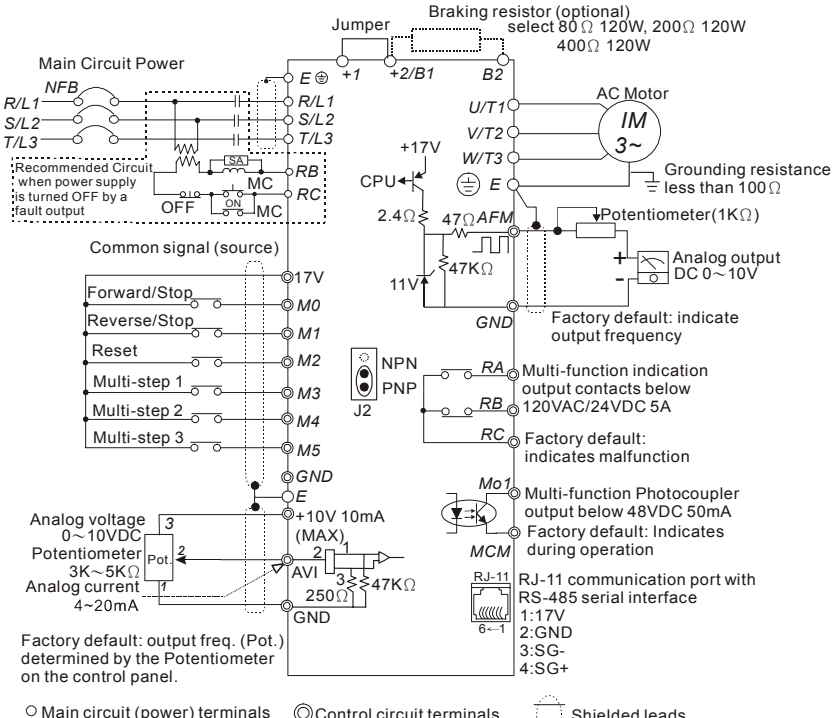


○ Main circuit (power) terminals ◎ Control circuit terminals Shielded leads

NOTE: Do not plug in a Modem or telephone line to the RS-485 communication port, permanent damage may result. Terminal 1 & 2 are the power sources for the optional copy keypad and should not be used while using RS-485 communication.

* If it is single phase model, please select any of the two input power terminals in main circuit power.

For VFDXXXSXXE
PNP (source mode)



○ Main circuit (power) terminals ◎ Control circuit terminals Shielded leads

NOTE: Do not plug in a Modem or telephone line to the RS-485 communication port, permanent damage may result. Terminal 1 & 2 are the power sources for the optional copy keypad and should not be used while using RS-485 communication.

* If it is single phase model, please select any of the two input power terminals in main circuit power.

Power Terminals

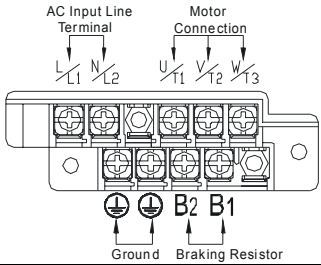


Figure 1: VFD002S11A/11B, VFD004S11A/11B

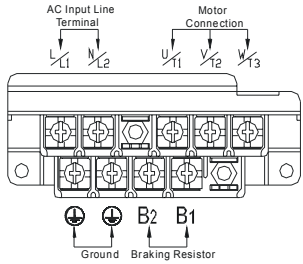


Figure 2: VFD007S11A/B

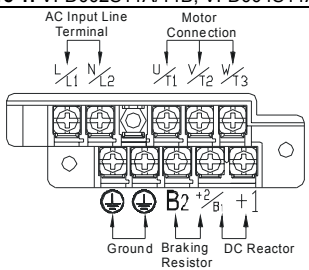


Figure 3: VFD002S21A/E, VFD004S21A/E, VFD007S21A/E

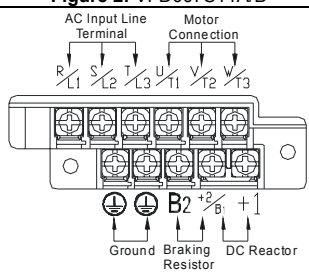


Figure 4: VFD002S21B/23A, VFD004S21B/23A/43A/43B/43E, VFD007S21B/23A/43A/43B/43E, VFD015S23D

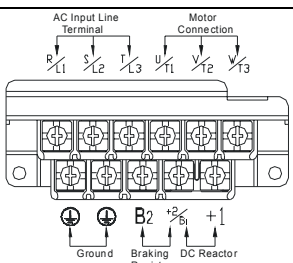


Figure 5: VFD015S21U/43D/43E/43U, VFD022S21U/23D/43D/43E/43U

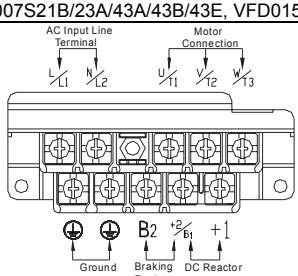


Figure 6: VFD015S21D/E, VFD022S21D/E

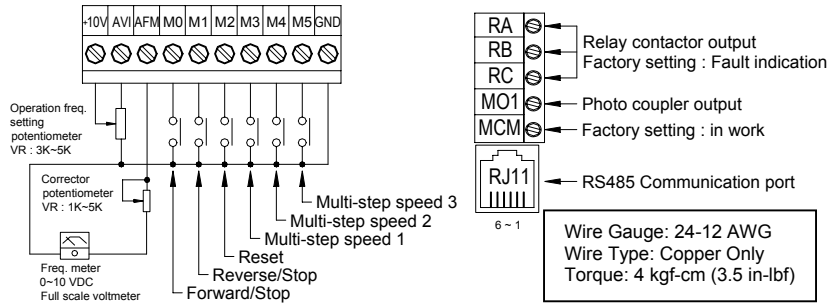
Figure 1/figure3/figure 4: **Wire Gauge: 14-20 AWG (2.1-0.5mm^2)** **Wire Type: copper wire only, 75°C** **Torque: 12 kgf-cm (10 in-lbf)**	**Figure 2/figure5/figure 6:** **Wire Gauge: 10-18 AWG (5.3-0.8mm^2)** **Wire Type: stranded copper wire only, 75°C** **Torque: 20 kgf-cm (17.4 in-lbf)**

Terminal Explanations

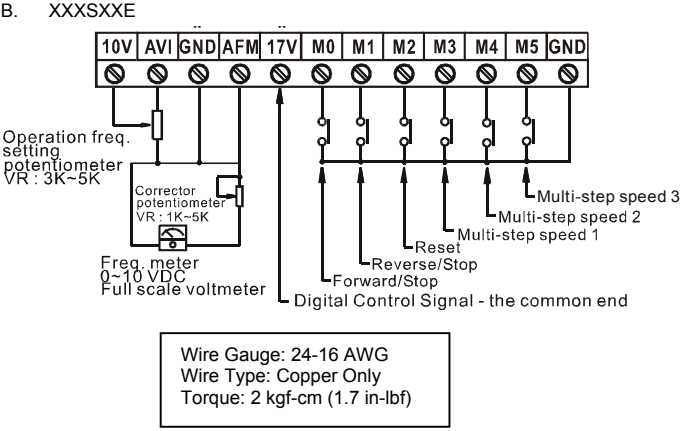
Terminal Symbol	Explanation of Terminal Function
R/L1, S/L2, T/L3	AC line input terminals (three phase)
L/L1, N/L2	AC line input terminals (single phase)
U/T1, V/T2, W/T3	Motor connections
+2/B2 – B1	Connections for Braking Resistor (optional)
+2/+1 – B1	Connections for DC Link Reactor (optional)
⏚	Earth Ground

Control Terminal Wiring (Factory Setting)

A. XXXSXXA/B/D/U



B. XXXSXXE


10V AVI GND AFM 17V M0 M1 M2 M3 M4 M5 GND
Operation freq. setting potentiometer VR : 3K~5K
Corrector potentiometer VR : 1K~5K
Freq. meter 0~10 VDC Full scale voltmeter
Multi-step speed 3
Multi-step speed 2
Multi-step speed 1
Reset
Reverse/Stop
Forward/Stop
Digital Control Signal - the common end
Wire Gauge: 24-16 AWG
Wire Type: Copper Only
Torque: 2 kgf-cm (1.7 in-lbf)

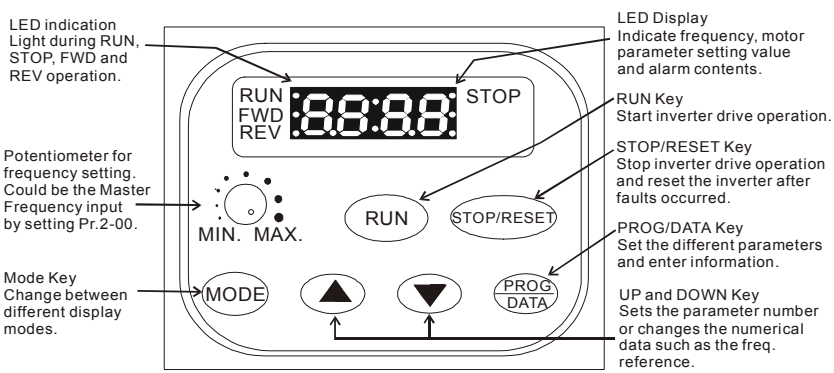
Terminal Explanations

Terminal symbols	Terminal name	Remarks
RA-RC	Multi-Function Indication Output Contact	Refer to Pr.3-06 Relay output contact RA-RC (N.O. Contact) RB-RC (N.C. Contact)
RB-RC	Multi-Function Indication Output Contact	
MO1-MCM	Multi-function PHC output	Refer to Pr.3-05
RJ-11	Serial communication port	RS-485 serial communication interface
+10V-GND	Power for speed setting	Power Supply (+10 V/10mA)
AVI-GND	Analog voltage/current freq. command	0 to +10 V (Max. Output Frequency) Input **or** 4 to 20mA (Max. Output Frequency) Input
AFM-GND	Analog frequency/current meter	0 to +10 V (Max. output Frequency) Output
17V	DC Voltage Source	(17V/20mA), used for source mode.
M0	Multi-function auxiliary input	Refer to Pr.4-04 to Pr.4-08
M1	Multi-function input 1	
M2	Multi-function input 2	
M3	Multi-function input 3	
M4	Multi-function input 4	
M5	Multi-function input 5	
GND	Digital Signal Common	

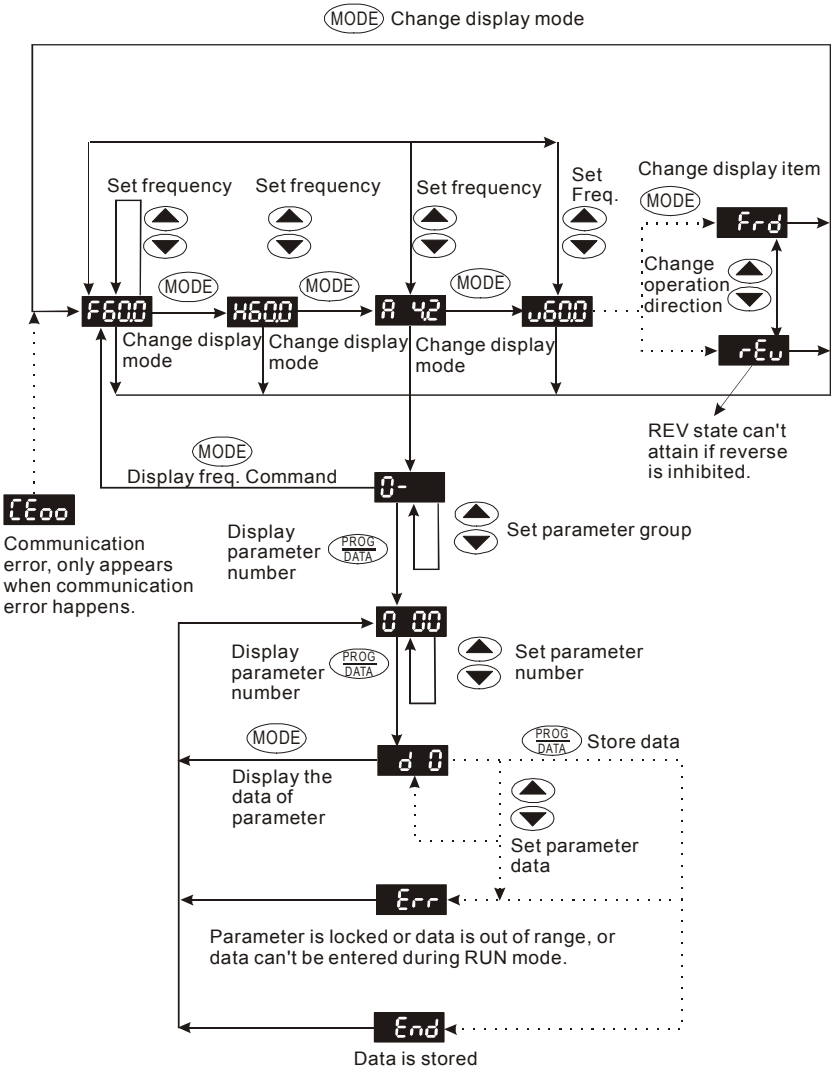
Note: Use twisted-shielded, twisted-pair or shielded-lead wires for the control signal wiring. It is recommended to run all signal wiring in a separate steel conduit. The shield wire should only be connected at the drive. Do not connect shield wire on both ends.

Description of Digital Keypad

This digital keypad includes two parts: Display panel and keypad. Display panel provides the parameter display and shows operation status of the AC drive. Keypad provides programming interface between users and AC drives.



Operation steps of the Digital Keypad



Summary of Parameter Settings

✓: The parameter can be set during operation.

Group 0 User Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
0-00	Identity Code of the AC Motor Drive	Read-only	d #	
0-01	Rated Current Display of the AC Motor Drive	Read-only	d##.#	
0-02	Parameter Reset	d09: All parameters are reset to factory settings	d0	
✓0-03	Start-up Display Selection	d0: Display the frequency command value (LED F) d1: Display the actual output frequency (LED H) d2: Multifunction display, see Pr.00-04 d3: Display output current (LED A) d4: Display forward/reverse command (Frd/rEv)	d0	
✓0-04	Content of Multi-Function Display	d0: Display User-Defined Unit (u) d1: Display Counter Value (C) d2: Display Process Operation (1.tt) d3: Display DC-BUS Voltage ($\bar{u}$) d4: Display output voltage (E) d5: Display frequency commands of PID (P) d6: Display analog feedback signal value (b) (%)	d0	
✓0-05	User-Defined Coefficient K	d0.1 to d160	d1.0	
0-06	Software Version	Read-only	d#.#	
0-07	Password Input	d0 to d999	d0	
0-08	Password Set	d0 to d999	d0	
✓0-09	Memory Mode Selections	d0 to d63	d8	

Group 1 Basic Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
1-00	Maximum Output Frequency (Fmax)	d50.0 to d400 Hz	d60.0	
1-01	Maximum Voltage Frequency (Fbase)	d10.0 to d400 Hz	d60.0	
1-02	Maximum Output Voltage (Vmax)	230V series: d2.0V to d255V 460V series: d4.0V to d510V	d220 d440	
1-03	Mid-Point Frequency (Fmid)	d1.0 to d400 Hz	d1.0	
1-04	Mid-Point Voltage (Vmid)	230V series: d2.0V to d255V 460V series: d4.0V to d510V	d12 d24	
1-05	Minimum Output Frequency (Fmin)	d1.0 to d60.0 Hz	d1.0	
1-06	Minimum Output Voltage (Vmin)	230V series: d2.0V to d255V 460V series: d4.0V to d510V	d12.0 d24.0	
1-07	Output Frequency Upper Limit	d1 to d110%	d100	
1-08	Output Frequency Lower Limit	d0 to d100%	d0	
✓1-09	Accel Time 1	d0.1 to d600 Sec	d10.0	
✓1-10	Decel Time 1	d0.1 to d600 Sec	d10.0	
✓1-11	Accel Time 2	d0.1 to d600 Sec	d10.0	
✓1-12	Decel Time 2	d0.1 to d600 Sec	d10.0	

Pr.	Explanation	Settings	Factory Setting	NOTE
↗1-13	Jog Acceleration / Deceleration Time	d0.1 to d600 Sec	d10.0	
↗1-14	Jog Frequency	d1.0 Hz to d400 Hz	d6.0	
1-15	Auto acceleration / deceleration (refer to Accel/Decel time setting)	d0: Linear Accel/Decel d1: Auto Accel, Linear Decel d2: Linear Accel, Auto Decel d3: Auto Accel/Decel (Set by load) d4: Linear Accel; Auto Decel, Stall Prevention during Decel d5: Auto Accel/Decel, Stall Prevention during Decel	d0	
1-16	Acceleration S-Curve	d0 to d7	d0	
1-17	Deceleration S-Curve	d0 to d7	d0	
1-18	Jog Decelerating Time	d0.0 Jog Decelerating Time Determined by Pr.1-13 d0.1 to d600	d0.0	

Group 2 Operation Method Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
2-00	Source of Master Frequency Command	d0: Master Frequency input determined by digital keypad. (record the frequency of power loss and it can do analog overlap plus) d1: Master Frequency determined by analog signal DC 0V-10V (external terminal AVI). (won't record the frequency of power loss and it can't do analog overlap plus) d2: Master Frequency determined by analog signal DC 4mA - 20mA (external terminal AVI). (won't record the frequency of power loss and it can't do analog overlap plus) d3: Master Frequency determined by Potentiometer on the digital keypad. (won't record the frequency of power loss and it can do analog overlap plus) d4: Master Frequency operated by RS-485 serial communication interface and record frequency of power loss. (record the frequency of power loss and it can do analog overlap plus)	d0	

Pr.	Explanation	Settings	Factory Setting	NOTE
2-00	Source of Master Frequency Command	d5: Master Frequency operated by RS-485 serial communication interface and won't record frequency before power loss. (won't record the frequency of power loss and it can do analog overlap plus)	d0	
2-01	Source of Operation Command	d0: Digital Keypad d1: External terminals. Keypad STOP/RESET enabled. d2: External terminals. Keypad STOP/RESET disabled. d3: RS-485 serial communication (RJ-11) .Keypad STOP/RESET enabled. d4: RS-485 serial communication (RJ-11). Keypad STOP/RESET disabled.	d0	
2-02	Stop Method	d0: STOP: ramp to stop; E.F.: coast to stop d1: STOP: coast to stop; E.F.: coast to stop	d0	
2-03	PWM Carrier Frequency Selections	d3: 3KHz d4: 4KHz d5: 5KHz d6: 6KHz d7: 7KHz d8: 8KHz d9: 9KHz d10: 10KHz	d10	
2-04	Motor Direction Control	d0: Enable forward/reverse operation d1: Disable reverse operation	d0	
2-05	Loss of ACI Signal	d0: Decelerate to 0 Hz d1: Coast to stop and display "EF" d2: Continue operation by last frequency command	d0	
2-06	Analog Auxiliary Frequency Operation	d0: Disable d1: Enable + AVI d2: Enable + ACI	d0	

Group 3 Output Function Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
3-00	Analog Output Signal	d0: analog frequency meter d1: analog current meter	d0	
✓3-01	Analog Output Gain	d1 to d200%	d100	
3-02	Desired Frequency Attained	d1.0 to d400 Hz	d1.0	
3-03	Terminal Count Value	d0 to d999	d0	
3-04	Preliminary Count Value	d0 to d999	d0	
3-05	Multi-Function Output Terminal 1 (Photocoupler Output)	d0: No Function	d1	

Pr.	Explanation	Settings	Factory Setting	NOTE
3-06	Multi-Function Output Terminal 2 (Relay Output)	d1: AC Drive Operational d2: Master Frequency Attained d3: Zero Speed d4: Over Torque Detection d5: Base-Block (B.B.) Indication d6: Low-Voltage Indication d7: Operation Mode Indication d8: Fault Indication d9: Desired Frequency Attained d10: PLC Program Running d11: PLC Program Step Completed d12: PLC Program Completed d13: PLC Program Operation Paused d14: Terminal Count Value Attained d15: Preliminary Count Value Attained d16: AC Motor Drive Ready d17: FWD command Indication d18: REV command Indication	d8	

Group 4 Input Function Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
↗4-00	Potentiometer Bias Frequency	d 0.0 to d 100.0%	d0.0	
↗4-01	Potentiometer Bias Polarity	d0: Positive Bias d1: Negative Bias	d0	
↗4-02	Potentiometer Frequency Gain	d1 to d200 %	d100	
4-03	Potentiometer Reverse Motion Enable	d0: Forward Motion Only d1: Reverse Motion enabled	d0	
4-04	Multi-Function Input Terminal 1 (M0, M1)	d0: No Function d1: FWD/STOP, REV/STOP d2: FWD/REV, RUN/STOP d3: 3-wire Operation Control Mode d4: E.F. External Fault Input (N.O.) d5: E.F. External Fault Input (N.C.) d6: Reset d7: Multi-Step Speed Command 1 d8: Multi-Step Speed Command 2 d9: Multi-Step Speed Command 3 d10: Jog Operation d11: Accel/decel Inhibit d12: First or Second Acceleration/deceleration Time Selection d13: External base block (N.O.) d14: External base block (N.C.)	d1	
4-05	Multi-Function Input Terminal 2 (M2)		d6	
4-06	Multi-Function Input Terminal 3 (M3)		d7	
4-07	Multi-Function Input Terminal 4 (M4)	d15: Up: Increment master frequency d16: Down: Decrement master frequency d17: Run PLC Program	d8	

Pr.	Explanation	Settings	Factory Setting	NOTE
4-08	Multi-Function Input Terminal 5(M5)	d18: Pause PLC Program d19: Counter Trigger Signal d20: Counter Reset d21: Select ACI / Deselect AVI d22: PID Function Disabled d23: JOG FWD d24: JOG REV d25: The source of master frequency is AVI. d26: The source of master frequency is ACI. d27: Press UP/DOWN key to switch forward/reverse (N.O.) motion d28: Press UP/DOWN key to switch forward/reverse (N.C.) motion d29: M0: 0: RUN 1: STOP, M1: no function, Direction is controlled by keypad	d9	
4-09	Line Start Lockout	d0: Disable d1: Enable	d0	
4-10	Up/Down Mode	d0: Based on accel/decel time d1: Up frequency according to constant speed, down frequency according to deceleration time d2: Up frequency according to acceleration time, down frequenc according to constant speed d3: Constant speed	d3	
4-11	Accel/Decel Rate of Change of UP/DOWN Operation with Constant Speed	0~1000, unit: 5 Hz/sec	d1	

Group 5 Multi-Step Speed and PLC Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
5-00	1st Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-01	2nd Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-02	3rd Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-03	4th Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-04	5th Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-05	6th Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-06	7th Step Speed Freq.	d0.0 to d400 Hz	d0.0	
5-07	PLC Mode	d0: Disable PLC Operation d1: Execute one program cycle d2: Continuously execute program cycles d3: Execute one program cycle step by step d4: Continuously execute one program cycle step by step	d0	

Pr.	Explanation	Settings	Factory Setting	NOTE
		d5: Disable PLC operation, but can set direction of 1st speed to 7th speed		
5-08	PLC Forward/ Reverse Motion	d0 to d255 (0: FWD 1: REV)	d0	
5-09	Time Duration of Zero Step Speed	d0 to d65500 Sec	d0	
5-10	Time Duration of 1st Step Speed	d0 to d65500 Sec	d0	
5-11	Time Duration of 2nd Step Speed	d0 to d65500 Sec	d0	
5-12	Time Duration of 3rd Step Speed	d0 to d65500 Sec	d0	
5-13	Time Duration of 4th Step Speed	d0 to d65500 Sec	d0	
5-14	Time Duration of 5th Step Speed	d0 to d65500 Sec	d0	
5-15	Time Duration of 6th Step Speed	d0 to d65500 Sec	d0	
5-16	Time Duration of 7th Step Speed	d0 to d65500 Sec	d0	

Group 6 Protection Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
6-00	Over-Voltage Stall Prevention	d0: Disable d1: Enable	d1	
6-01	Over-Voltage Stall Prevention Level	115V/230V series: d350 to d410V 460V series: d700 to d820V	d390 d780	
6-02	Over-Current Stall Prevention Level	d20 to d150%	d130	
6-03	Over-Torque Detection Mode	d0: Disabled d1: Enabled during constant speed operation. After the over-torque is detected, keep running until OL1 or OL occurs. d2: Enabled during constant speed operation. After the over-torque is detected, stop running. d3: Enabled during running and continues before Continuous Output Time Limit (Pr.6-05) is reached d4: Enabled during running. After the over-torque is detected, stop running.	d0	
6-04	Over-Torque Detection Level	d30 to d200%	d150	
6-05	Over-Torque Detection Time	d0.1 to d10.0 Sec	d0.1	
6-06	Electronic Thermal Overload Relay Selection	d0 to d2	d2	
↗6-07	Electronic Thermal Characteristic	d30 to d600 Sec	d60	
6-08	Present Fault Record	d0: No fault d1: Over current (oc) d2: Over voltage (ov) d3: Over heat (oH) d4: Over load (oL) d5: Over load (oL1) d6: External fault (EF) d7: Reserved	d0	

Pr.	Explanation	Settings	Factory Setting	NOTE
6-09 6-10	Second Most Recent Fault Record Third Most Recent Fault Record	d8: Reserved d9: Excess current during acceleration (ocA) d10: Excess current during deceleration (ocd) d11: Excess current during steady state (ocn) d12: Ground fault (GF) d13: Reserved d14: Low voltage (Lv) d15: CPU failure 1 (cF1) d16: CPU failure 2 (cF2) d17: Base block (b.b.) d18: Overload (oL2) d19: Auto acceleration/deceleration failure (cFA) d20: Software protection enable (codE) d21: Reserved d22: CPU failure (cF3.1) d23: CPU failure (cF3.2) d24: CPU failure (cF3.3) d25: CPU failure (cF3.4) d26: CPU failure (cF3.5) d27: CPU failure (cF3.6) d28: CPU failure (cF3.7) d29: Hardware protection failure (HPF.1) d30: Hardware protection failure (HPF.2) d31: Hardware protection failure (HPF.3) d32: Communication time-out (CE10) d33: Reserved d34: Software error (SErr) d35: Reserved d36: PID error (Pld) d37: Reserved d38: Phase loss (PHL)	d0	

Group 7 Motor Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
✓7-00	Motor Rated Current	d30 to d120%	d85	
✓7-01	Motor No-Load Current	d0 to d90%	d50	
✓7-02	Torque Compensation	d0 to d10	d1	
✓7-03	Slip Compensation	d0.0 to d10.0	d0.0	

Group 8 Special Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
8-00	DC Braking Voltage Level	d0 to d30%	d0	

Pr.	Explanation	Settings	Factory Setting	NOTE
8-01	DC Braking Time during Start-Up	d0.0 to d60.0 Sec	d0.0	
8-02	DC Braking time during Stopping	d0.0 to d60.0 Sec	d0.0	
8-03	Start-Point for DC Braking	d0.0 to d400 Hz	d0.0	
8-04	Momentary Power Loss Operation Selection	d0: Operation stops after Momentary Power Loss d1: Operation continues after momentary power loss, speed search starts with the Master Frequency reference value d2: Operation continues after momentary power loss, speed search starts with the minimum frequency	d0	
8-05	Maximum Allowable Power Loss Time	d0.3 to d5.0 Sec	d2.0	
8-06	B.B. Time for Speed Search	d0.3 to d5.0 Sec	d0.5	
8-07	Current Limit for Speed Search	d30 to d200%	d150	
8-08	Skip Frequency 1 Upper Limit	d0.0 to d400 Hz	d0.0	
8-09	Skip Frequency 1 Lower Limit	d0.0 to d400 Hz	d0.0	
8-10	Skip Frequency 2 Upper Limit	d0.0 to d400 Hz	d0.0	
8-11	Skip Frequency 2 Lower Limit	d0.0 to d400 Hz	d0.0	
8-12	Skip Frequency 3 Upper Limit	d0.0 to d400 Hz	d0.0	
8-13	Skip Frequency 3 Lower Limit	d0.0 to d400 Hz	d0.0	
8-14	Auto Restart After Fault	d0 to d10	d0	
8-15	AVR Function	d0: Enable d1: Disable d2: Disable when deceleration	d2	
8-16	Software Braking Level	115V/230V series: d350 to d450V 460V series: d700 to d900V	d380 d760	
8-17	DC Braking Lower Bound Limit	d0.0 to d400 Hz	d0.0	

Group 9 Communication Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
∕9-00	Communication Address	d1 to d254	d1	
∕9-01	Transmission Speed	d0: Baud Rate 4800 bps d1: Baud Rate 9600 bps	d1	
∕9-01	Transmission Speed	d2: Baud Rate 19200 bps d3: Baud Rate 38400 bps	d1	
∕9-02	Transmission Fault Treatment	d0: Warn and Keep Operating d1: Warn and Ramp to Stop d2: Warn and Coast to Stop d3: Keep Operating without Warning	d0	
∕9-03	Time-out Detection	d0: Disable d1 to d20: time setting (1 sec increment)	d0	
∕9-04	Communication Protocol	d0: 7,N,2 (Modbus, ASCII) d1: 7,E,1 (Modbus, ASCII) d2: 7,O,1 (Modbus, ASCII) d3: 8,N,2 (Modbus, ASCII)	d0	

Pr.	Explanation	Settings	Factory Setting	NOTE
		d4: 8,E,1 (Modbus, ASCII) d5: 8,O,1 (Modbus, ASCII) d6: 8,N,2 (Modbus, RTU) d7: 8,E,1 (Modbus, RTU) d8: 8,O,1 (Modbus, RTU)		

Group A PID Parameters

Pr.	Explanation	Settings	Factory Setting	NOTE
A-00	Input terminal for PID Feedback	d0: Disable PID function d1: Negative PID feedback from external terminal (AVI) 0 to +10V d2: Negative PID feedback from external terminal (ACI) 4 to 20mA d3: Positive PID feedback from external terminal (AVI) 0 to +10V d4: Positive PID feedback from external terminal (ACI) 4 to 20mA	d0	
A-01	Gain over PID Detection value	d0 to d999	d100	
A-02	Proportional Gain (P)	d0 to d999	d100	
A-03	Integral Time (I)	d0 to d999	d100	
A-04	Derivative Control (D)	d0 to d100	d0	
A-05	Upper Bound for Integral Control	d0 to d100%	d100	
A-06	Primary Delay Filter Time	d0 to d999	d0	
A-07	PID Output Freq. Limit	d0 to d110%	d100	
A-08	Feedback Signal Detection Time	d0.0 to d650 seconds	d0.0	
A-09	Treatment of the Erroneous Feedback Signals	d0: warn and RAMP to stop d1: warn and COAST to stop	d0	
A-10	Sleep Frequency	d0.0 to d400Hz	d0.0	
A-11	Wakeup Frequency	d0.0 to d400Hz	d0.0	
A-12	Sleep Period	d0.0 to d650 seconds	d0.0	
A-13	PID User Defined	d0.0 to d400	d0.0	

Fault Codes

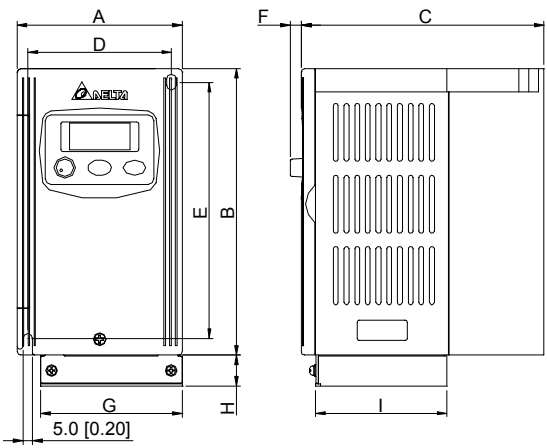
Fault Name	Fault Descriptions	Corrective Actions
oc	**Over current** Abnormal increase in current.	1. Check if motor power corresponds with the AC motor drive output power. 2. Check the wiring connections to U/T1, V/T2, W/T3 for possible short circuits. 3. Check the wiring connections between the AC motor drive and motor for possible short circuits, also to ground.

Fault Name	Fault Descriptions	Corrective Actions
oc	**Over current** Abnormal increase in current.	4. Check for loose contacts between AC motor drive and motor. 5. Increase the Acceleration Time. 6. Check for possible excessive loading conditions at the motor. 7. If there are still any abnormal conditions when operating the AC motor drive after a short-circuit is removed and the other points above are checked, it should be sent back to manufacturer.
ou	**Over voltage** The DC bus voltage has exceeded its maximum allowable value.	1. Check if the input voltage falls within the rated AC motor drive input voltage range. 2. Check for possible voltage transients. 3. DC-bus over-voltage may also be caused by motor regeneration. Either increase the Decel. Time or add an optional brake resistor. 4. Check whether the required braking power is within the specified limits.
oH	**Overheating** Heat sink temperature too high	1. Ensure that the ambient temperature falls within the specified temperature range. 2. Make sure that the ventilation holes are not obstructed. 3. Remove any foreign objects from the heatsinks and check for possible dirty heat sink fins. 4. Check the fan and clean it. 5. Provide enough spacing for adequate ventilation.
Lu	**Low voltage** The AC motor drive detects that the DC bus voltage has fallen below its minimum value.	1. Check whether the input voltage falls within the AC motor drive rated input voltage range. 2. Check whether the motor has sudden load. 3. Check for correct wiring of input power to R-S-T (for 3-phase models) without phase loss.
oL	**Overload** The AC motor drive detects excessive drive output current. **NOTE: The AC motor drive can withstand up to 150% of the rated current for a maximum of 60 seconds.**	1. Check whether the motor is overloaded. 2. Reduce torque compensation setting in Pr.7-02 3. Take the next higher power AC motor drive model.
oL 1	**Overload 1** Internal electronic overload trip	1. Check for possible motor overload. 2. Check electronic thermal overload setting. 3. Use a higher power motor. 4. Reduce the current level so that the drive output current does not exceed the value set by the Motor Rated Current Pr.7-00.
oL2	**Overload 2** Motor overload.	1. Reduce the motor load. 2. Adjust the over-torque detection setting to an appropriate setting (Pr.6-03 to Pr.6-05).
ocA	**Over-current during acceleration**	1. Short-circuit at motor output: Check for possible poor insulation at the output lines. 2. Torque boost too high: Decrease the torque compensation setting in Pr.7-02

Fault Name	Fault Descriptions	Corrective Actions
ocA	**Over-current during acceleration**	3. Acceleration Time too short: Increase the Acceleration Time. 4. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
ocd	**Over-current during deceleration**	1. Short-circuit at motor output: Check for possible poor insulation at the output line. 2. Deceleration Time too short: Increase the Deceleration Time. 3. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
ocn	**Over-current during steady state operation**	1. Short-circuit at motor output: Check for possible poor insulation at the output line. 2. Sudden increase in motor loading: Check for possible motor stall. 3. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
EF	**External Fault**	1. When multi-function input terminals (MI1-MI6) are set to external fault, the AC motor drive stops output U, V and W. 2. Give RESET command after fault has been cleared.
cF1	**Internal EEPROM can not be programmed.**	Return to the factory.
cF2	**Internal EEPROM can not be programmed.**	Return to the factory.
cF3	**Drive's internal circuitry abnormal.**	1. Switch off power supply. 2. Check whether the input voltage falls within the rated AC drive input voltage. Switch on the AC drive.
HPF	**Hardware protection failure.**	Return to the factory.
codE	**Software protection failure**	Return to the factory.
cFA	**Auto accel/decel failure**	1. Check if the motor is suitable for operation by AC motor drive. 2. Check if the regenerative energy is too large. 3. Load may have changed suddenly.
GF	**Ground fault**	When (one of) the output terminal(s) is grounded, short circuit current is more than 50% of AC motor drive rated current, the AC motor drive power module may be damaged. **NOTE: The short circuit protection is provided for AC motor drive protection, not for protection of the user.** 1. Check whether the IGBT power module is damaged. 2. Check for possible poor insulation at the output line.

Fault Name	Fault Descriptions	Corrective Actions
cE1	**Communication Error**	1. Check the RS485 connection between the AC motor drive and RS485 master for loose wires and wiring to correct pins. 2. Check if the communication protocol, address, transmission speed, etc. are properly set.
bb	**External Base Block.** (Refer to Pr. 8-06)	1. When the external input terminal (B.B) is active, the AC motor drive output will be turned off. 2. Deactivate the external input terminal (B.B) to operate the AC motor drive again.

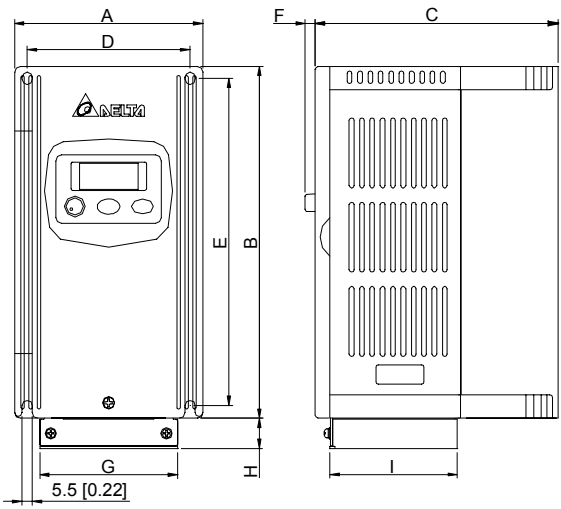
Dimensions are in mm [inch]



Model Name	A	B	C	D	E	F	G	H	I
002S11A/21A/23A	85.0 [3.35]	148.0 [5.83]	88.0 [3.47]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	-	-	-
004S11A/21A/23A	85.0 [3.35]	148.0 [5.83]	102.0 [4.02]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	-	-	-
004S43A/43E, 007S21A/23A	85.0 [3.35]	148.0 [5.83]	124.0 [4.89]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	-	-	-
007S43A/43E	85.0 [3.35]	148.0 [5.83]	126.0 [4.96]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	-	-	-
002S21E, 004S21E, 007S21E, 015S23D	85.0 [3.35]	148.0 [5.83]	127.0 [5.00]	74.0 [2.92]	133.7 [5.27]	5.8 [0.23]	-	-	-
002S11B/21B/23B	85.0 [3.35]	148.0 [5.83]	88.0 [3.47]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	73.0 [2.88]	16.0 [0.63]	67.8 [2.67]
004S11B/21B/23B	85.0 [3.35]	148.0 [5.83]	102.0 [4.02]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	73.0 [2.88]	16.0 [0.63]	67.8 [2.67]
004S43B, 007S21B/23B	85.0 [3.35]	148.0 [5.83]	124.0 [4.89]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	73.0 [2.88]	16.0 [0.63]	67.8 [2.67]

Model Name	A	B	C	D	E	F	G	H	I
007S43B	85.0 [3.35]	148.0 [5.83]	126.0 [4.96]	74.0 [2.92]	132.2 [5.21]	5.8 [0.23]	73.0 [2.88]	16.0 [0.63]	67.8 [2.67]

Dimensions are in mm [inch]



Model Name	A	B	C	D	E	F	G	H	I
015S21A/23A	100.0 [3.94]	186.0 [7.33]	143.0 [5.63]	86.5 [3.41]	173.0 [6.82]	5.4 [0.21]	-	-	-
015S21D/21E, 022S21D/21E/23D	100.0 [3.94]	186.0 [7.33]	129.3 [5.09]	86.5 [3.41]	173.0 [6.82]	5.4 [0.21]	-	-	-
007S11A, 015S43A/43E, 022S23A/43A/43E	100.0 [3.94]	186.0 [7.33]	129.0 [5.08]	86.5 [3.41]	173.0 [6.82]	5.4 [0.21]	-	-	-
022S21A	118.0 [4.65]	220.0 [8.67]	130.9 [5.16]	105.5 [4.16]	207.0 [8.16]	4.4 [0.17]	-	-	-
007S11B, 015S21B/23B/43B, 022S23B/43B	100.0 [3.94]	186.0 [7.33]	129.0 [5.08]	86.5 [3.41]	173.0 [6.82]	5.4 [0.21]	73.0 [2.88]	16.0 [2.67]	67.8 [2.67]
022S21B	118.0 [4.65]	220.0 [8.67]	130.9 [5.16]	105.5 [4.16]	207.0 [8.16]	4.4 [0.17]	73.0 [2.88]	16.0 [2.67]	67.8 [2.67]
015S21U/43U 022S21U/43U	100.0 [3.94]	186.0 [7.33]	129.3 [5.09]	86.5 [3.41]	173.0 [6.82]	5.4 [0.21]	73.0 [2.88]	16.0 [2.67]	67.8 [2.67]